

Remarks/Arguments

Claims 1-6 and 8-16 are pending in the application. Claims 1, 2, 4, 11 and 14 are amended and new claims 17 and 18 have been added. Claims 1-6 and 8-18 are therefore currently pending in the application.

Claim 1 has been amended to include features of claim 2 and for clarity, and claim 2 has been amended accordingly. Claims 4 and 14 have been amended to correct errors, as discussed further below. Claim 11 has been amended for clarity. New claims 17 and 18 have been added, the support for which can be found in claims 1 and 2. No new matter has been added.

Objections and Rejections

The abstract stands objected to. Claims 1-6 and 8-16 stand rejected under 35 U.S.C. § 112, second paragraph. Claims 1, 3-6, 11 and 13-16 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,902,784 ("Hellsten"). Claims 1-6 and 8-16 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hellsten. Applicants respectfully submit that the currently pending claims are patentable and the application is in condition for allowance for at least the following reasons.

Response to Objection to the Specification

The Office objects to the abstract of the disclosure for not being on a separate sheet, as it was provided with the first page of the WO document. Applicants have corrected the abstract by providing the abstract on a separate sheet.

Response to Rejections under 35 U.S.C. § 112, Second Paragraph

The Office rejects claims 1-6 and 8-16 under 35 U.S.C. § 112, second paragraph, as indefinite. Specifically, the Office asserts that in independent claims 1, 8 and 11 it is unclear whether the concentration of the electrolytes referred to in the claims include the components (a), (b) and (c). Claims 1 and 11 have been amended to clarify that it is the water recited in each of these respective independent claims that has "an electrolyte content from 0.01-7% by weight." Applicants submit that as set forth in

claims 1, 8 and 11, it is the water that includes this electrolyte content. In other words, the claim elements (a), (b) and (c) are included in addition to the water, which water has an electrolyte content from 0.01-7% by weight, without elements (a), (b) and/or (c). This is clear from the specification, for example at page 2, line 31 to page 3, line 8 and claim 11. For example, claim 11 recites “[a] new method of reducing drag in waters *containing electrolytes*, which comprises *adding to said waters containing said electrolytes* at least one drag reducing agent . . . wherein said waters containing said electrolyte have an electrolyte content from 0.01-7% by weight.” Thus, it is the waters to which the at least one drag reducing agent is added that contains electrolytes of the claimed content. Furthermore, a betaine, which is a zwitterionic compound, cannot dissociate into ions because the charges are part of the same molecule. It is clear that the claimed drag reducing agents are therefore added to waters having the recited electrolyte content. The drag reducing agents are themselves not part of this content.

The Office further indicates that claims 4 and 14 are considered to be further indefinite. Claims 4 and 14 have been amended to overcome this rejection. Applicants submit that the rejection of claims 4 and 14 has been overcome.

Response to Rejections under 35 U.S.C. § 102(b)

The Office rejects claims 1, 3-6, 11 and 13-16 as anticipated by Hellsten. As a preliminary matter, in the Claim Interpretation section of the Office Action, the Office states that “the electrolyte concentration and the concentrations of (a), (b), and (c) overlap.” (Office Action, page 3). The Office asserts “[i]t is therefore proper for a reference that employs (a), (b), and/or (c) at concentrations reading on the electrolyte concentrations to conclude that said reference meets the electrolyte concentration limitation based on said (a), (b), and (c) concentrations.” (Office Action, page 3).

Applicants submit that such a construction of the claims is improper. Each of claim elements (a), (b) and (c) is a separate feature and independent of the others. Such features are also independent of and in addition to the water, to which (a), (b) and/or (c) is added, which water has an electrolyte content from 0.01-7% by weight. Contrary to the Office’s assertion, it is thus improper for the Office to cite a reference

that employs (a), (b), and/or (c) at the claimed concentrations and then conclude that such concentrations also read on the electrolyte concentrations of the water. As noted above, the electrolyte concentration of the water is a separate element, independent of the concentrations of features (a), (b) and/or (c). As a result, the Office's rejection of claim 11 is based on the incorrect conclusion that the "reference meets the electrolyte concentration based on said (a), (b) and (c) concentrations." Applicants submit, therefore, that the rejection of the claims is improper and must be withdrawn.

Notwithstanding, with the amendment to claim 1 to include features of claim 2, Applicants submit that the rejection of claim 1 (and claims 3-6 which depend from claim 1) under Section 102(b) is now moot. Independent claim 11, however, remains rejected.

As recited in independent claim 11, Applicants' invention is directed to a new method of reducing drag in waters containing electrolytes. The claim includes the step of adding to the waters containing the electrolytes at least one drag-reducing agent. Claim 11 adds to the waters containing the electrolytes a specified combination of compounds, namely, compounds a), b) and c), specified concentrations of the specified compounds a), b) and c), and that the compounds present in an amount of a), b) and c) of 50-400 ppm. Claim 11 also provides that the waters containing the electrolytes have an electrolyte content from 0.01-7% by weight.

In comparing Applicants' invention, as recited in claim 11, to that of Hellsten, Applicants submit that at least the following features are distinguishable. First, the zwitterionic surfactant of claim 11 is of the type $R_1NHC_3H_6N^+(R_3)(R_4)R_5COO^-$, where R_1 is an acyl group, i.e. it does not include $RN^+(CH_3)(CH_3)CH_2COO^-$, where R is an alkyl group. Second, the zwitterionic surfactant has an acyl group with 12-16 carbon atoms, which is a subset or species of the 10-24 carbon atoms of disclosed in Hellsten. Third, the claimed drag reducing agent of claim 11 includes the feature of compounds a), b) and c) *in an amount of a), b) and c) of 50-400 ppm*. Finally, the water to which the drag reducing agent recited in claim 11 is added has an electrolyte content from 0.01-7% by weight. Applicants submit that the combination of the claimed features cannot be

considered to have been “clearly envisaged” or disclosed with “sufficient specificity” to have rendered the claims anticipated by Hellsten.

More specifically, in the example of Hellsten, namely Example 1, in which its drag reducing agent is added to sea water (water including electrolyte concentration), the only zwitterionic surfactant used in this Example is of the type $RN^+(CH_3)(CH_3)CH_2COO^-$, where R is an alkyl group having 16 carbon atoms. This is distinguishable over Applicants’ claimed zwitterionic surfactant of the type $R_1NHC_3H_6N^+(R_3)(R_4)R_5COO^-$, where R_1 is an acyl group having 12-16 carbon atoms. Applicants see no disclosure in Hellsten indicating which zwitterionic surfactants are employed when there is a high electrolyte content in the water. In fact, in Example 1 when the drag reducing agent is used in high electrolyte content water, the claimed zwitterionic agent is not used.

Further, in Example 1 of Hellsten, the zwitterionic surfactant is present in an amount of 1075 ppm and the anionic compound is present in an amount of 165 ppm. The total amount of these compounds, namely 1240 ppm, is thus much higher than the amount stated in claim 11 of the present invention, namely 50-400 ppm. In other words, the amount of combined drag reducing agents of Example 1 is over 3.5 times higher than the upper limit of 400 ppm of Applicants’ invention, as recited in claim 11. Applicants submit that based on the disclosure of Hellsten, claim 11 would not have been “clearly envisaged” or disclosed with “sufficient specificity” to have rendered it anticipated by Hellsten.

Claims 13-16, which are dependent on independent claim 11, are also not anticipated by Hellsten for at least the reasons that claim 11 is not anticipated.

Response to Rejections under 35 U.S.C. § 103(a)

The Office rejects claims 1-6, and 8-16 as obvious over Hellsten. According to the Office, “[t]o the extent that Hellsten et al reference differs from the claims as not clearly envisaged or disclosed with sufficient specificity, it would have been obvious to one of ordinary skill . . . to employ the betaine and anionic surfactant combination for their advantageous use as drag reducing agents taught in the Hellsten et al reference.” (Office Action, page 6). The rationale the Office uses to support the rejection is that it

would have been merely a variation of the optimal concentration for the advantage of reducing drag. (Office Action, page 6).

In addition, with respect to claim 1 (based on the version prior to the amendment herein to include features of claim 2), the Office further asserts that "[t]o the extent the Hellsten et al reference differs from the claims in the combination of betaines having a C₁₄₋₁₆ acyl group with betaines having a C₁₈₋₂₂ acyl group, it would have been obvious to one of ordinary skill in the art . . . to employ mixed betaines and anionic surfactant combination for their advantageous use as drag reducing agents taught in the Hellsten et al reference having a broad temperature application. (Applicants presume the Office intended this point to be directed to the combination of betaines having a C₁₂₋₁₆ acyl group (claimed feature a)) with betaines having a C₁₈₋₂₂ acyl group (claimed feature b).) The rationale the Office uses to support its position is that it would have been merely a variation of the optimal concentration for the advantage of reducing drag at particular temperature applications.

Regarding the Office's first argument, contrary to the Office's assertions, Applicants respectfully submit that the drag reducing agent of claims 1, 8 and 11 are nonobvious over Hellsten. Specifically, Applicants' invention, as recited in claims 1, 8 and 11 provides a surprising and unexpected drag-reducing effect at large temperature intervals, but at lower concentrations, than that of Hellsten. (See specification, at pages 2-3). Compared to Example 1 of Hellsten, i.e. the example using sea water (water containing a high electrolyte content), the zwitterionic surfactant in Example 1 is present in an amount of 1075 ppm and the anionic compound is present in an amount of 165 ppm. With a total amount of 1240 ppm, Hellsten's disclosed drag reducing agent requires a much higher amount than claim 1 of the present invention, which includes 50-400 ppm. Thus, as noted above, Hellsten requires over 3.5 times more than the upper limit of 400 ppm of Applicants' invention, as recited in claims 1, 8 and 11.

As disclosed in Hellsten, its product of Example 1 works in a temperature range of 13-24°C. On the other hand, when using a zwitterionic surfactant according to claim 1 (see Table 1 Test 6 and 7) in an amount of 200 ppm and 100 ppm, which is a much lower concentration than in Example 1 of Hellsten, the temperature range is 30-66°C

and 34-65°C respectively. This range is considerably broader and encompasses higher temperatures. Applicants submit that Hellsten neither discloses nor suggests that such results were predicted or predictable.

The Office asserts, at page 5, that Hellsten discloses “the combination of anionic sulfates and sulfonates with betaine surfactants having the structure set forth as formula (I), where R is the group $R'NC_3H_6-$ and R' (column 3, lines 6-19) is set forth as an acyl group having 14-16 carbon atoms for use in cooling media at 30°C or below and an acyl group having 18 carbon atoms or more . . . for heat-transfer medium at temperatures in the range of 50-120°C.” Applicants submit, however, that this assertion is inaccurate.

At col. 3, lines 6-14, Hellsten actually discloses

Thus, the drag-reducing additives may be used in a cooling media at temperatures below 30°C, when, for example using betaine surfactants, where the alkyl or acyl group has 14-16 carbon atoms, and in a heat-transfer medium at a temperature in the range of 50-120°C, when, for example using betaine surfactants where the alkyl or acyl group contains 18 carbon atoms or more, preferably 18-22 carbon atoms and one or two double bonds. (emphasis added).

Hellsten therefore discloses that where the alkyl or acyl group has 14-16 carbon atoms (without specifying conditions, such as electrolyte content) these additives may be used in a cooling media at temperatures below 30°C. This is distinguishable from the present invention as evidenced, for example, by Example 1, Tests 6 and 7 of the Applicants' specification, where the use of the claimed drag reducing agents result in a temperature range of 30-66°C and 34-65°C, respectively, which are both clearly above 30°C. Table 1 of Applicants' specification also includes other examples of ranges of temperatures with limits above 30°C. Applicants are not aware of such properties in Hellsten. Thus, one of ordinary skill in the art would not have had a reason to modify Hellsten to produce Applicants' invention.

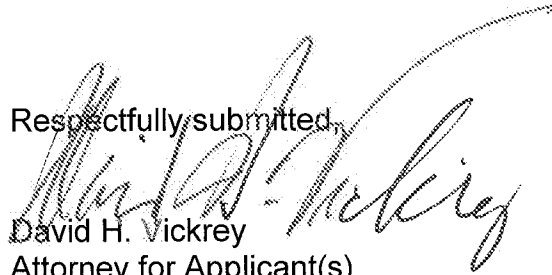
Applicants submit, therefore, that claims 1, 8 and 11 are patentable over Hellsten for at least the reasons set forth above. Claims 2-6, 9, 10 and 12-18 are also patentable for at least the reasons that claims 1, 8 and 11, from which they depend are patentable, but may also be patentable for additional reasons as well.

Regarding the Office's second argument, for amended claim 1 and dependent claim 12, these claims include the combination of a) and b) in which b) is included in an amount of 10-70% by weight based on the total amount of a), b) and c). Applicants submit that the invention as recited in these claims is thus even further distinguishable over Hellsten in that Applicants see no disclosure or suggestion in Hellsten of these claimed features. Applicants submit that the effect on the temperature range is even more pronounced when the combination of the two zwitterionic surfactants is used, particularly in high electrolyte waters. For example, in Test 9, the resulting temperature range is 25-65°C. Such evidences considerably broader and higher temperature ranges than Hellsten for water having higher electrolyte concentrations. Hellsten, therefore, fails to render obvious Applicants' invention as recited in independent claim 1 or dependent claim 12.

Conclusion

In view of the arguments set forth above, Applicants respectfully submit that the pending application is in condition for allowance. Notice to this effect is earnestly solicited.

Respectfully submitted,


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